ALTA 2022 26
20-27 May | Perth, Australia | Online

RECOVERY IMPROVEMENT IN TREATMENT OF REFRACTORY COPPER ORES USING ELEVATED TEMPERATURE LEACHING- A CASE OF KONKOLA COPPER MINES ZAMBIA

By

Milton Simukoko, Trevor Chalwe, Chisulo Sakala, Octave Ligopi, Timothy Kabengele, David Ng'andu and Field Kondowe

Konkola Copper Mines, Zambia

Presenters and Corresponding Authors

Milton Simukoko and Trevor Chalwe

ABSTRACT

In the last three decades, economic conditions and the increasingly stringent environmental legislation worldwide have made metallurgical industries more difficult to develop. In the case of copper; resources become increasingly depleted and the number of low grade copper ores grow day after day. In the case of Konkola Copper Mines (KCM), ore grades have significantly reduced from an average of 2% to 1% Total Copper in the last two decades and much of the resource has been depleted leading to treatment of Refractory Ores. Currently Refractory Ores account for approximately 40% of the feed to processing plants. Refractory Ores by nature are difficult to float as minerals are locked in the mica lattice with floatation recoveries averaging less than 15% TCu. Tailings from the floatation circuit are treated at the Tailings Leach Plant.

Currently the Tailings Leach Plant (TLP) produces copper cathode by Acid Leaching Copper Tailings averaging 0.9% Total Copper 40% of which is refractory in nature. Tailings Leach Plant recoveries average less than 50% Total Copper.

A representative sample of Tailings Leach Plant feed was cut and subjected to leach tests on a laboratory scale at current plant conditions (pH-1.8; density 1250 gpl; residence time 2hrs) with varying temperature between 25^{o}C and 70 ^{o}C. Further tests were conducted varying pH between 1 and 3, Residence Time between 30 minutes and 3 hours, Density between 1100gpl and 1400gpl. At optimized parameters, pilot tests were carried out in a Batch reactor.

Results obtained showed that at 60^{o}C, leach recovery increased to 70%. Optimized parameters for optimum leach recovery established were: Temperature 60^{o}C, pH 1.6, Residence time 2.5hrs, Density 1250gpl. Laboratory results were replicated on pilot scale.

Financial evaluation based on incremental copper produced as a result of increasing leaching temperature showed that this process is viable with Net Present Value (NPV) over five years $67million at LME Cu $ 6,500/t. To fully implement this work, capital expenditure is required to install steam boilers, heat exchangers, pumps and screens.

Keywords: Refractory Ores, leaching, recovery, elevated temperature, NPV (Net Present Value).